

Gardenia brighamii
(Hawaiian gardenia, Na`u)

5-Year Review
Summary and Evaluation

U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii

5-YEAR REVIEW

Species reviewed: *Gardenia brighamii* (Hawaiian gardenia, Na'u)

TABLE OF CONTENTS

1.0	GENERAL INFORMATION.....	1
1.1	Reviewers.....	1
1.2	Methodology used to complete the review.....	1
1.3	Background.....	1
2.0	REVIEW ANALYSIS.....	2
2.1	Application of the 1996 Distinct Population Segment (DPS) policy.....	2
2.2	Recovery Criteria.....	3
2.3	Updated Information and Current Species Status.....	4
2.4	Synthesis.....	7
3.0	RESULTS.....	8
3.1	Recommended Classification.....	8
3.2	New Recovery Priority Number.....	8
3.3	Listing and Reclassification Priority Number.....	8
4.0	RECOMMENDATIONS FOR FUTURE ACTIONS.....	8
5.0	REFERENCES.....	9
	Signature Page.....	10

5-YEAR REVIEW
***Gardenia brighamii* (Hawaiian gardenia, Na`u)**

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:

Region 1, Jesse D'Elia, Chief, Division of Recovery, (503) 231-2071

Lead Field Office:

Pacific Islands Fish and Wildlife Office, Gina Shultz, Assistant Field Supervisor for Endangered Species, (808) 792-9400

Cooperating Field Office(s):

N/A

Cooperating Regional Office(s):

N/A

1.2 Methodology used to complete the review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (USFWS) between June 2006 and June 2007. The Hawaii Biodiversity and Mapping Program provided most of the updated information on the current status of *Gardenia brighamii*. They also provided recommendations for conservation actions that may be needed prior to the next five-year review. The evaluation of the lead PIFWO biologist was reviewed by the Plant Recovery Coordinator. These comments were incorporated into the draft five-year review. The document was then reviewed by the Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before final approval.

1.3 Background:

1.3.1 FR Notice citation announcing initiation of this review:

USFWS. 2006. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 70 species in Idaho, Oregon, Washington, Hawaii, and Guam. Federal Register 71(69):18345-18348.

1.3.2 Listing history

Original Listing

FR notice: USFWS. 1985. Determination of endangered status for *Gardenia brighamii* (Na'u or Hawaiian Gardenia) & withdrawal of proposed critical habitat, final rule. Federal Register 50(162):33728-33731.

Date listed: August 21, 1985

Entity listed: Species

Classification: Endangered

Revised Listing, if applicable

FR notice: N/A

Date listed: N/A

Entity listed: N/A

Classification: N/A

1.3.3 Associated rulemakings:

None

1.3.4 Review History:

Species status review [FY 2006 Recovery Data Call (September 2006)]:
Declining

Recovery achieved:

1 (0-25%) (FY 2006 Recovery Data Call)

1.3.5 Species' Recovery Priority Number at start of this 5-year review:

2

1.3.6 Current Recovery Plan or Outline

Name of plan or outline: Recovery plan for the Hawaiian gardenia (*Gardenia brighamii*). 1993. U.S. Fish and Wildlife Service, Portland, Oregon. 69 pages.

Date issued: September 30, 1993

Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?

 Yes
 X No

2.1.2 Is the species under review listed as a DPS?

 Yes
 X No

2.1.3 Was the DPS listed prior to 1996?

☐ *Yes*
☐ *No*

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

☐ *Yes*
☐ *No*

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?

☐ *Yes*
☐ *No*

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?

☐ *Yes*
☒ *No*

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

☒ *Yes*
☐ *No*

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

☒ *Yes*
☐ *No*

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery?

☒ *Yes*
☐ *No*

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

A synthesis of the threats (Factors A, C, D, and E) affecting this species is presented in section 2.4. Factor B (overutilization for commercial, recreational, scientific, or educational purposes) is not known to be a threat to this species.

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for Oahu Plants (USFWS 1993). To be considered stable, the six populations remaining at the time of the recovery plan was published must be composed of at least 20 reproductive plants that are genetically representative of the original wild population. In addition, these populations must be fenced from herbivores and protected from seed predators, introduced invasive plant species, and disease. Plants must be able to complete their life cycle within the fenced exclosures. All of the remaining individuals must be represented in an *ex situ* (off-site) collection.

This recovery objective has not been met.

For downlisting, the stabilization targets must be realized, and the species is represented by 750 plants in three healthy, naturally reproducing, fenced populations, each with 50 mature plants on each of Lanai, Molokai, Oahu, Maui, and the island of Hawaii.

This recovery objective has not been met.

For delisting, *Gardenia brighamii* should be represented by at least three populations, each with at least 100 mature, healthy, reproductive individuals, on secure lands on each of Oahu, Hawaii, Maui, Molokai, and Lanai. These 15 populations must be unfenced, unmanipulated, self-reproducing, and stable over a period of 10 years.

This recovery objective has not been met.

2.3 Updated Information and Current Species Status

In addition to the status summary table below, information on the species' status and threats was included in the recovery plan referenced above in section 1.3.6 ("Associated Rulemakings") and in section 2.4 ("Synthesis") below, which also includes any new information about the status and threats of the species.

Status of *Gardenia brighamii* from listing through 5-year review.

Date	No. wild inds	No. outplanted	Stability Criteria	Stability Criteria Completed?
1985 – listing	7	0	Fenced from herbivores and protected from seed predators, introduced invasive plants, competitor and diseases/pathogens	No
			Plant must be able to complete life cycle in fenced exclosures	No

Date	No. wild inds	No. outplanted	Stability Criteria	Stability Criteria Completed?
			Complete genetic storage of 17-19 individuals by at least 5 plants each growing <i>ex situ</i>	No
			Increase remaining 6 populations and each population should have 20 reproductive individuals derived from the original population	No
1993 – recovery plan	17-19	64-66 and 207 plants in nursery	Fenced from herbivores and protected from seed predators, introduced invasive plants, competitor and diseases/pathogens	No
			Plant must be able to complete life cycle in fenced exclosures	No
			Complete genetic storage of 17-19 individuals by at least 5 plants each growing <i>ex situ</i>	Partially
			Increase remaining 6 populations and each population should have 20 reproductive individuals derived from the original population	No
2007 – 5-yr review	11	Unknown	Fenced from herbivores and protected from seed predators, introduced invasive plants, competitor and diseases/pathogens	No
			Plant must be able to complete life cycle in fenced exclosures	No

Date	No. wild inds	No. outplanted	Stability Criteria	Stability Criteria Completed?
			Complete genetic storage of 17-19 individuals by at least 5 plants each growing <i>ex situ</i>	Partially
			Increase remaining 6 populations and each population should have 20 reproductive individuals derived from the original population	No

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

2.3.1.4 Taxonomic classification or changes in nomenclature:

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

2.3.1.7 Other:

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

2.3.2.3 Disease or predation:

2.3.2.4 Inadequacy of existing regulatory mechanisms:

2.3.2.5 Other natural or manmade factors affecting its continued existence:

2.4 Synthesis

Gardenia brighamii is one of three *Gardenia* species endemic to Hawaii (USFWS 1993). It was collected in the past on Oahu, Maui, the island of Hawaii, Lanai, and Molokai, although it is believed to have occurred on Kauai, Niihau, and Kahoolawe as well. The trees have been dying over the years due to loss of dry forest habitat. Other factors such as feral animals (Factors A and D), horticultural pests (Factor C), and rats (Factor C) have contributed as well. The plants on Maui, historically known from Olowalu Valley, are considered extirpated. The last trees on Molokai on the slopes of Mauna Loa at Mahana were confirmed dead in 2005 (S. Perlman 2006). Two trees remain on Oahu, and nine trees remain on Lanai. *Gardenia brighamii* has been cultivated widely, and planted in gardens throughout the Hawaiian islands (USFWS 1993).

The present threats to *Gardenia brighamii* are habitat degradation by feral pigs (*Sus scrofa*), axis deer (*Axis axis*), sheep (*Ovis aries*) (on Lanai) (Factors A and D); predation by horticultural pests (black twig borer (*Xylosandrus compactus*)), various aphids, green coffee scale, mealy bugs (all three “farmed” by introduced ants), thrips and red spider mites) (Factor C); seedling and fruit predation by game birds (Factor C); fire (Factor E); and stochastic extinction due to small population numbers (Factor E) (S. Perlman 2006; TenBruggencate and Hurley 2001).

Gardenia brighamii has been grown from wild-collected seed at Lyon Arboretum and National Tropical Botanical Garden for many years. A new Department of Land and Natural Resources, Division of Forestry and Wildlife Nursery at Olinda, Maui is also planning to grow it (Department of Land and Natural Resources 2003b) and it is grown at the Volcano Rare Plant Facility on the Big Island (Hawaii, Department of Land and Natural Resources Division of Forestry and Wildlife 2003c).

Progeny grown at National Tropical Botanical Garden from cuttings of the last tree from Mahana, Molokai, were taken to Molokai’s Mid-elevation Rare Plant Nursery in October of 2006 (M. Clark, National Tropical Botanical Garden, pers. comm. 2006). Outplanting can be problematic because *Gardenia* species are susceptible to a number of insect problems. Outplanting has been done on both Oahu at the Honouliuli Preserve in the Waianae Mountains and from the Pahole Rare Plant Facility (Department of Land and Natural Resources Division of Forestry and Wildlife

2002a). On Lanai it is planted at the Kanepuu Preserve (The Nature Conservancy 2004) and in an enclosure built at Awehi Road where over 100 *Gardenia brighamii* individuals were outplanted in 1998, but none survived (H. Oppenheimer, Plant Extinction Prevention Program, pers. comm.. 2007). *Gardenia brighamii* is also planted in the Manuka Natural Area Reserve (NAR) at Kau, Hawaii (Department of Land and Natural Resources Division of Forestry and Wildlife 2003a). It has been planted at all of Hawaii's botanical gardens, including the National Tropical Botanical Garden gardens on Kauai and Maui. It is unclear how many outplanted individuals constitute reintroduction populations as opposed to garden planting, or how many individuals have survived.

The stabilization and recovery goals for this species have not been met, as only 11 mature individuals remain in the wild and all threats are not currently being managed. Therefore, *Gardenia brighamii* meets the definition of endangered as it remains in danger of extinction throughout its range.

3.0 RESULTS

3.1 Recommended Classification:

☐ Downlist to Threatened

☐ Uplist to Endangered

☐ Delist

☐ Extinction

☐ Recovery

☐ Original data for classification in error

☒ No change is needed

3.2 New Recovery Priority Number:

Brief Rationale:

3.3 Listing and Reclassification Priority Number:

Reclassification (from Threatened to Endangered) Priority Number: _____

Reclassification (from Endangered to Threatened) Priority Number: _____

Delisting (regardless of current classification) Priority Number: _____

Brief Rationale:

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS:

- Continue seed collection for genetic storage.
- Reestablish populations on Hawaii, Maui, and Molokai. It may be advisable to create new populations of *Gardenia brighamii* which include individuals representing both sexes from several populations, in hopes of cross-pollinating them for seed.

- As *Gardenia brighamii* is susceptible many insect pests, locating any inherently resistant individuals would be useful, especially in selecting plants for outplanting. If effective treatments exist, it is important to make sure the remaining wild trees and outplanted trees are monitored and treated as necessary.
- Fence individual plants for short-term protection from ungulates.

5.0 REFERENCES:

Hawaii, Department of Land and Natural Resources, Division of Forestry and Wildlife. 2003a. Section 6 Project Proposal –FY 2003, Natural Area Reserve Program, Facilities Construction – Dry Forest Restoration, Manuka N.A.R., Hawaii EPDC 17. Unpublished.

Hawaii, Department of Land and Natural Resources, Division of Forestry and Wildlife. 2003b. Section 6 Project Proposal –FY 2003, Statewide Endangered Plant Program, Plant Population Management – Olinda Nursery, Maui EPBP 15. Unpublished.

Hawaii, Department of Land and Natural Resources, Division of Forestry and Wildlife. 2003c. Section 6 Project Proposal –FY 2003, Statewide Endangered Plant Program, Plant Population Management-Propagation and Outplanting, Volcano Rare Plant Facility, Hawaii EPBP 13. Unpublished.

Perlman, S. 2006. National Tropical Botanical Garden, Summary of field logs for *Gardenia brighamii*, 2006. Unpublished.

TenBruggencate, J. and T. Hurley. 2001. “Rare seeds stolen from nature preserve; Lanai thief targets endangered plant,” Honolulu Advertiser, June 23, 2001.

The Nature Conservancy. 2004. Kanepu`u Preserve, Island of Lana`i.
<http://nature.org/whrewework/northamerica/states/hawaii/preserves/art2356.html>

[USFWS] U.S. Fish and Wildlife Service. 1993. Recovery Plan for the Hawaiian *Gardenia* (*Gardenia brighamii*). Portland, OR, 69 pages.

[USFWS] U.S. Fish and Wildlife Service. 1985. Determination of endangered status for *Gardenia brighamii* (Na`u or Hawaiian *Gardenia*) & withdrawal of proposed critical habitat, final rule. Federal Register 50(162):33728-33731.

Personal and Written Communications:

Clark, Margaret. 2006. National Tropical Botanical Garden, personal communication, March 6, 2007.

Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Gardenia brighamii* (Hawaiian gardenia, Na'u)

Current Classification: E

Recommendation resulting from the 5-Year Review:

- ☐ Downlist to Threatened
- ☐ Uplist to Endangered
- ☐ Delist
- ☒ No change needed

Appropriate Listing/Reclassification Priority Number, if applicable: _____

Review Conducted By:

Marilet A. Zablan, Recovery Program Leader and Acting Assistant Field Supervisor for Endangered Species, July 2, 2007

Marie Bruegmann, Plant Recovery Coordinator, May 8 and July 2, 2007

Joy Hiromasa, Fish and Wildlife Biologist, June 26, 2007

Approve 
Lead Field Supervisor, Fish and Wildlife Service

Date 1/18/08